

WAKAMATHA TASSELLI GEN. ET SP. NOV., A FOSSIL  
DASYURID (MARSUPIALIA) FROM SOUTH AUSTRALIA  
CONVERGENT ON MODERN SMINTHOPSIS

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ABSTRACT

*Wakamatha tasselli gen. et sp. nov.* is described from the modern unconsolidated bed load sediments of Billeroo Creek. The original provenance of the holotype and only known specimen (National Museum of Victoria, P33253) is uncertain. Adjacent formations exposed in the Creek bank include the middle Miocene Namba Formation and the Pleistocene Eurinilla Formation. *Wakamatha tasselli* differs from all other known dasyurids in the construction of the talonid of  $M_4$  and the large size of  $P_3$ . The talonid structure is convergent on that of *Sminthopsis crassicaudata* and suggests an adaptation enabling greater transverse jaw movement, and finer commutation of foods.

New Cainozoic formations have been recently described from the Tarkarooloo Basin by Callen and Tedford (1976). They describe the Miocene Namba and Pleistocene Eurinilla Formations. The vertebrate faunas from the Namba Formation have been announced by Tedford *et al.* (1977) but no formal descriptions have been made. The vertebrate fauna from the Eurinilla Formation similarly has not yet been described.

In 1974, T. Rich, C. Tassell, and I. Stewart (all of the National Museum of Victoria) found vertebrate fossils in the bed of Billeroo Creek on Frome Downs Station, including the holotype and only known specimen of the dasyurid *Wakamatha tasselli* described here. Subsequent, extensive collections made in 1976 and 1977 by T. Rich, M. Archer, and I. Stewart at the type locality failed to produce any additional dasyurid material. On the occasion of all three visits, the site where the holotype was collected was under about 50 centimetres of water. Samples were taken from beneath the water wherever particles larger than sand size were felt when groping with bare hands through the bottom sediments, experience having shown that anything larger at that locality was likely to be bone.

Dental nomenclature follows Archer (1976, 1978).

SYSTEMATICS

Superfamily DASYUROIDEA  
Family DASYURIDAE

*Wakamatha gen. nov.*

TYPE SPECIES: *Wakamatha tasselli gen. et sp. nov.*

GENERIC DIAGNOSIS: Differs from all known dasyurids in having a combination of the following three characters: (1) the  $P_3$  was (based on alveoli) very large, probably longer than  $M_2$ ; (2) the talonid of at least  $M_4$  ( $M_{2-3}$  are missing) has a functional transverse crest developed between the hypoconid and entoconid that is formed by the posterior cristid of the entoconid being oriented posterobuccally and united directly with the lingual end of the hypocristid; (3) the talonid of  $M_5$  is transversely compressed.

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ORIGIN OF GENERIC NAME: *Waka*, little; *matha*, bite; central South Australian Aboriginal words (Gason 1879) in reference to the small size of this marsupial carnivore.

*Wakamatha tasselli* sp. nov.

HOLOTYPE: National Museum of Victoria P33253, left dentary fragment with  $M_{4-5}$  and alveoli for  $P_3-M_3$ .

TYPE LOCALITY: 31° 11'S, 140° 16'E, on the bottom of a bend of Billeroo Creek, Frome Downs Station, South Australia.

STRATIGRAPHIC HORIZON. Unknown. It was found in unconsolidated mud and silt at the base of Billeroo Creek. The formations exposed in the adjacent bank of the Creek are the Namba (Miocene) and Eurinilla (Pleistocene) Formations.

DESCRIPTION

Alveoli: The alveoli of  $P_3$  suggest that  $P_3$  was longer-crowned than  $M_2$  and subequal in length to  $M_3$ . The anterior alveolus of  $P_3$  is also wider than the anterior alveolus of  $M_2$ .

$M_4$ : The trigonid is damaged with the tips of the protoconid and metaconid missing, as well as the occlusal edge of the metaacristid. The paraconid is shorter than the metaconid which was probably shorter than the protoconid. The entoconid is subequal in height to the paraconid. The hypoconid is shorter than the entoconid. The paraacristid is longer than the metaacristid which is longer than the hypocristid. The short cristid obliqua extends from the hypoconid to a point below and buccal to the midpoint of the metaacristid. A very tiny enamel swelling continues up the posterior face of the trigonid from the point of the intersection of the cristid obliqua and the trigonid. The hypocristid extends lingually across the talonid towards the posterior flank of the entoconid and terminates against the buccal end of a postentocristid that swings posterobuccally from the entoconid. The point of juxtaposition of the ends of these two crests occurs on the lingual half of the talonid, anterobuccal to the hypoconulid. The entoconid also has a preentocristid that extends anteriorly to the posterolingual edge of the trigonid. This crest provides a steep lingual wall for the talonid basin. The preentocristid and postentocristid form two halves of a crescent with the median point represented by the entoconid, and the concave surface directed anterobuccally. The metaacristid (although damaged) and hypocristid appear to have been oriented transversely with respect to the long axis

of the tooth row. The hypoconulid is very low on the posterolingual corner of the talonid. No crest connects the hypoconulid to the hypocristid. The entoconid is only worn at the very tip while the hypoconid sustains a much larger and crescent-shaped wear facette. The posterior cingulum is short but continuous from the posterior base of the hypoconid to the buccal edge of the hypoconulid. The anterior cingulum is relatively longer. It descends anterolingually from the anterobuccal flank of the protoconid to the base of the crown and then ascends lingually to the hypoconulid notch. The lingual side of the hypoconulid notch is poorly-defined by the anterolingual basal corner of the paraconid. There is no buccal cingulum around the base of the protoconid or hypoconid, although there is a slight cingulum at the buccal edge of the midvalley between the bases of those two cusps. The talonid is wider than the trigonid. The talonid basin is shallow but enclosed on all sides. The lingual side of the tooth is longer than the buccal side.

$M_5$ : This tooth has the tips of the protoconid and metaconid missing. The paraconid is shorter than the metaconid which was shorter than the protoconid. The entoconid and hypoconid are closely approximated and only defined as the lingual and buccal ends respectively of a single, continuous crest. There is no hypoconulid. The paraacristid is longer than the metaacristid which is much longer than the very short hypocristid. The carnassial notch in the metaacristid occurs lingual to the midpoint of the metaacristid. The short cristid obliqua descends steeply to the lingual half of the midvalley and then begins to ascend the posterior flank of the trigonid at a point below the carnassial notch in the metaacristid. Half-way along the crest between the hypoconid and entoconid there is a small notch which presumably defines the boundary between the virtually transverse postentocristid and the transverse hypocristid, the two together functioning as a single transverse crest as in  $M_4$ . The entoconid and hypoconid sustain very small wear facettes (formed by wear with the postprotocristid on  $M^5$ ) that are united across the transverse talonid crest. There is no posterior cingulum. The anterior cingulum is as in the  $M_4$ . A buccal basal cingulum appears to have extended across the midvalley between the bases of the protoconid and hypoconid, but has presumably been breached by wear from the paracone of  $M^5$ . The talonid basin is shallow but enclosed on all sides by the preentocristid, cristid obliqua, and posterior transverse crest. The trigonid is much wider than

the talonid. The lingual side of the tooth is longer than the buccal side.

Meristic gradients between  $M_4$  and  $M_5$ : The paracristids and metacristids are subequal in length. The posterior (composite) talonid crest is much shorter in  $M_5$ . The cristid obliqua is more lingually positioned in  $M_5$ . The talonid is much narrower on  $M_5$ . The entoconid and hypoconid of  $M_5$  are much more reduced and approximated. The anterobuccal corner of the anterior cingulum is more gently and evenly convex in  $M_5$  (in  $M_4$  it is unevenly convex). The preentocristid is better-developed in  $M_4$ .

Dentary: The dentary is missing anterior to the  $P_3$  although the posterior face of the  $P_2$  posterior root alveolus is preserved. It is also missing part of the dentary posterior to the mandibular foramen. A mental foramen occurs below the anterior root of the  $M_2$ . The ventral rim of the dentary is slightly curved convexly below the  $M_5$  and then ascends linearly and gradually anteriorly. The depth of the dentary decreases gently anteriorly. The remnant of the ascending ramus suggests its anterior edge formed an approximate angle of  $120^\circ$  with respect to the alveolar row.

## DISCUSSION

The  $M_4$  of *Wakamatha tasselli* reveals a unique talonid construction among dasyurids. In most dasyurids that have entoconids, the cusp is oval, or even laterally compressed (Archer 1976), not crescent-shaped. Further, with the exception of some *Sminthopsis*, the hypocristid of  $M_4$  initially extends transversely or posterolingually across the talonid to ultimately contact the hypoconulid, not the entoconid. An exception (one other *Sminthopsis* approaches this condition) is *Sminthopsis crassicaudata*, but the structure of the talonid suggests it is convergent on the condition found in *Wakamatha tasselli*. In this highly apomorphic species of *Sminthopsis* (Archer 1976, 1977, and in preparation), the hypocristid extends transversely from the hypoconid to the posterobuccal corner of the entoconid and then turns sharply posteriorly to merge into the hypoconulid. As this tooth in *S. crassicaudata* sustains wear, the minor posterior element of the hypocristid is rapidly overrun and a functional uninterrupted transverse shearing crest is developed between the hypoconid and the entoconid. In *Wakamatha tasselli* this transverse crest development is achieved but in a different way and without the requirement of occlusal wear.

It is formed by the conjunction of a posterobuccally directed postentocristid and the hypocristid.

In both *Sminthopsis crassicaudata* and *Wakamatha tasselli*, the occlusal edge of this transverse talonid crest acts as a shearing counterpart to the postprotocrista of the  $M^4$ , while its posterior flank is worn by the anterior face of the metacone of  $M^4$ . The tip of the  $M^4$  metacone would have worn the posterior cingulum of  $M_4$  and anterior cingulum of  $M_5$ . All of these essential shearing counterparts are present in other dasyurids.

Convergence in this dental feature in two dasyurids suggests it has functional value. Although it is not clear what this value is, it may be that it facilitates the transverse movement of the dentary during which time food is crushed between the protocone and talonid basin. By removing the posterolingual limb of the hypocristid, the metacone can move transversely through a greater uninterrupted distance between the lower molars. Further, the upper and lower molars can occlude more closely, thereby being able to more finely commutate the food being crushed in the talonid basin.

Another unique dasyurid feature in *Wakamatha tasselli* is the very large size of  $P_3$  as indicated by the alveoli. This is a common feature among didelphids, borhyaenids, thylacinids, and some peramelids but not dasyurids.

It is of course possible that the alveoli interpreted here to represent  $P_3$  actually represent  $P_2$ ,  $P_3$  having been lost. Such reduction occurs in some modern species of *Antechinus*, *Planigale*, *Dasyurus*, *Dasyercus*, *Dasyuroides* and *Myoictis* (Archer 1976a). But even if this were the case in *Wakamatha tasselli*, none of the modern dasyurids that have lost  $P_3$  have a  $P_2$  that is longer than the  $M_2$ .

The alveoli interpreted here to represent  $P_3$  could also represent a single alveolus for a reduced  $P_3$ , and the posterior alveolus for the posterior root of a  $P_2$ . Against this interpretation is the fact that the bony septum between these two alveoli has a median swelling and a slight longitudinal thickening, features characteristic of a septum formed between the two converging roots of a single tooth, but not of a septum developed between two adjacent teeth.

Laterally compressed  $M_5$  trigonids are not found today among dasyurid species inhabiting high rainfall areas of New Guinea, but are universal among arid-adapted Australian dasyurids inhabiting the drier parts of central Australia. It is also not a feature of the middle Miocene *Ankotarinja tiranensis* (Archer 1976b) or of

structurally primitive Cretaceous and Tertiary didelphoids. It appears to be an apomorphic state within the Dasyuridae. It normally correlates in modern dasyurids with complete reduction of a metacone on M<sup>5</sup>.

The stratigraphic horizon from which *Wakamatha tasselli* originally came is unknown. Presumably it is either the middle Miocene Namba Formation, or the Pleistocene Eurinilla Formation, both of which are exposed in the adjoining banks of Billeroo Creek. Efforts to recover by wet sieving, more dasyurid specimens from the type locality, both from the soft muds, sands and silts that comprise the basal load of the Creek and from the sands and clays of the bank, were unsuccessful. We did recover fossil lungfish teeth, teleost spines, crocodile and turtle fragments, and an edentulous phalangeroid dentary. None of this material can at present be assigned with any confidence to either the Namba or Eurinilla Formations.

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PLATE 1

*Wakamatha tasseli* gen. et sp. nov., Holotype NMV P33253.

FIG. A: Stereo-triplet of the LM<sub>4-5</sub> in buccal-occlusal view.

FIG. B: Occlusal view of the entire dentary fragment with alveoli for P<sub>3</sub> to M<sub>3</sub>, and M<sub>4-5</sub>.

FIG. C: Anterior-occlusal view of the LM<sub>4-5</sub>.

White line equals 0.05 mm.

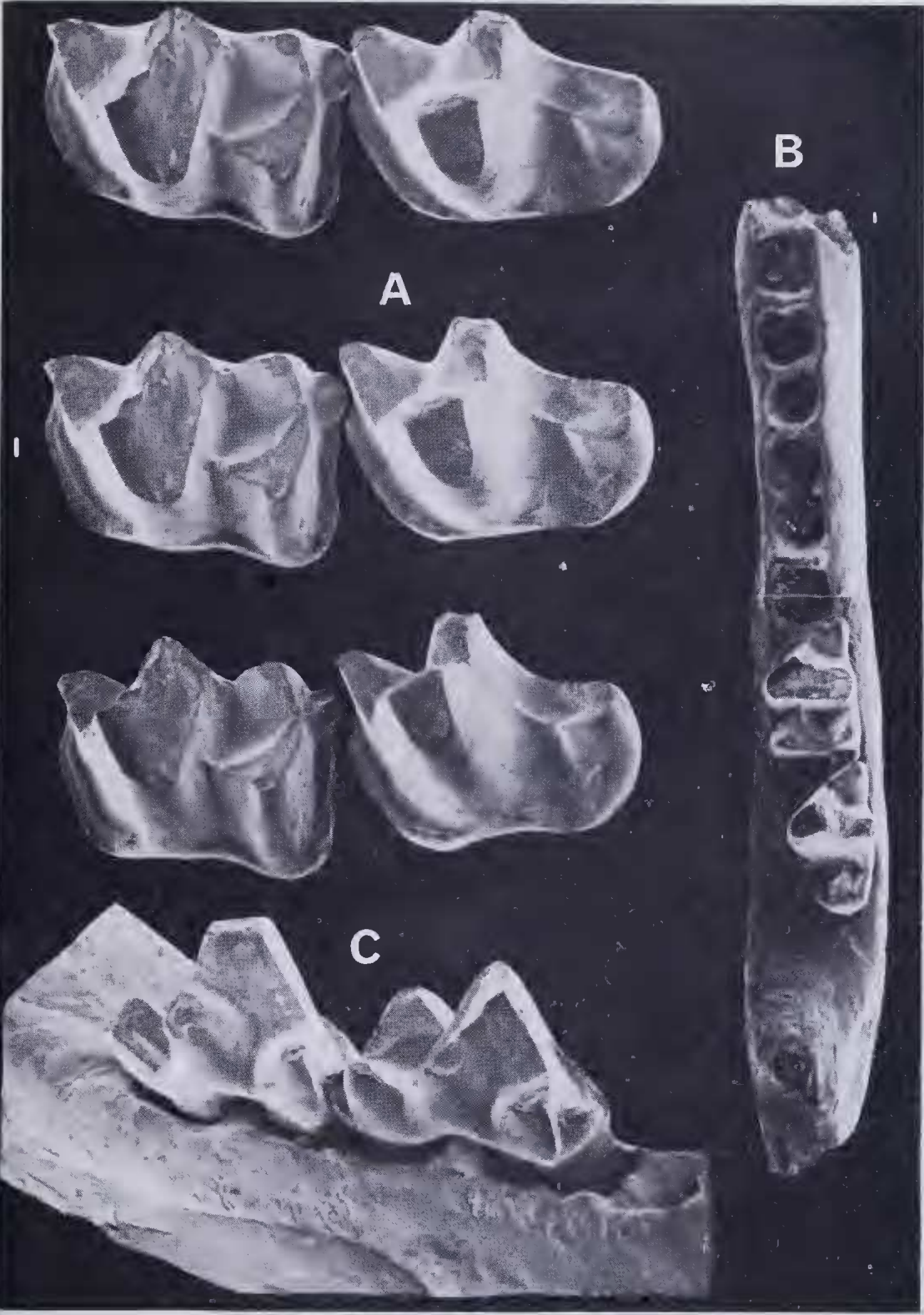


PLATE 2

*Wakamatha tasseli* gen. et sp. nov., Holotype NMV P33253.

FIG. A: Stereo-triplet of the LM<sub>4-5</sub> in lingual – occlusal view.

FIG. B: Stereo-triplet of the LM<sub>4-5</sub> in occlusal view.

White line equals 0.05 mm.



